Review of C++ Workshop

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URL Container

- Create a class to hold an ordered history of URLs (as might be used in a web browser). Use an STL container to store the URLs
- Ensure that a URL is added to the history only if it is not in the history already. If it is, it should be moved to the beginning of the history
- Write a program to test your class

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String input

- Write a program that reads strings entered by the user, stores them in a vector and prints out the strings in the order they were entered
- Change your program to use a list instead of a vector
- Change your program to use a deque instead of a list
- Change the list and deque versions to store the strings in reverse order, without performing any manipulation on their elements

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Maps

- Write a program that reads words from input
- Store the value and length of each word in a suitable std::pair
- Store each pair in
  - A vector
  - A map whose key and value have the appropriate types
- Print out all the elements of the vector and the map

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Overloading and override

- What is meant by
  - Overloading a member function?
  - Overriding a member function?

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Inheritance

- Write a hierarchy of three classes, Base, Child and Grandchild in which Child inherits from Base and Grandchild inherits from Child
- Give each class a print() member function which prints out the name of the class
- Write a print_class() function which takes a Base argument by value
- Create an instance of each class and call print_class()
- Explain your results

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Inheritance 2

- Change the print() member function to be virtual
- Run the program again and explain your results
- Change the print_function() argument to be passed by reference

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Inheritance 3

- Add an integer member to the Base class and a constructor which initializes it from its argument
- Why does the program not compile?
- What is the best way to solve this problem?

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Buffer Manager class

- The buffer manager class is a simple class that manages a resource (in this case, a memory buffer)
- It has the following interface:

```
class BufferManager {
   private:
      int size;
      char *buffer;
   public:
   BufferManager(int size=10);
   ~BufferManager();
   BufferManager(const BufferManager &other);
   BufferManager& operator =(const BufferManager& other);
};
```

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Buffer Manager class

- The Buffer Manager dynamically allocates the memory buffer in its constructor as an array of char
  - The constructor argument gives the number of bytes in the array
- The copy constructor and assignment operator perform a deep copy of the array
- The Buffer Manager's destructor releases the memory buffer
- What is the name for this idiom?
  - RAII - Release Acquisition Is Initialization
- Implement the Buffer Manager in its own namespace

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Buffer Manager class

- Write a program to test the class
  - This should exercise the copy constructor and assignment operator
  - It should also have a suitable handler for any exceptions that might be thrown
- Check that your program runs as expected in the absence of exceptions

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Buffer Manager Constructor

- Alter your program so that the constructor throws an std::bad_alloc exception
- Check that the exception is handled correctly
- Is the class destructor called? Explain your answer
- Add print statements to the program and check the results

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Buffer Manager Copy Constructor

- Alter your program so that the copy constructor throws an std::bad_alloc exception
- Check that the exception is handled correctly
- Is the class destructor called? Explain your answer
- Add print statements to the program and check the results

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Buffer Manager Assignment Operator

- Alter your program so that the assignment operator throws an std::bad_alloc exception
- Check that the exception is handled correctly
- Is the class destructor called? Explain your answer
- Add print statements to the program and check the results

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